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Demystifying CTFs

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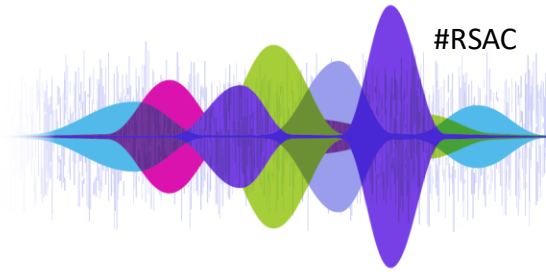

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Overview

Participating in CTFs

Running your own event

Building a CTF team

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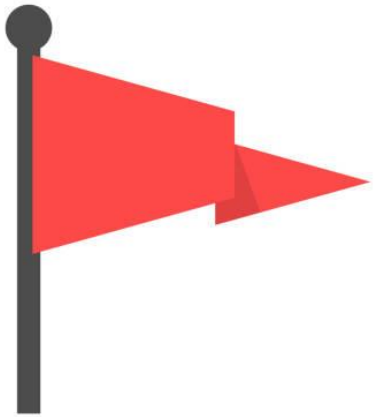
Participating in CTFs

What is a Capture the Flag (CTF)

- Gamified competition exploring different cyber security disciplines
- Each challenge has a solution measured by capturing a “flag”
- Flag formats like “flag{50me7hing_w1tty}”
- Time constrained event to solve challenges
- Creative flair



CTF Styles

- Jeopardy
  - Choose your own adventure
  - The challenges are not related to each other
  - Variety of challenge types
  - Point value aligned to difficulty

CTF Styles

- Attack and Defense
  - Offense & Defense skills required
  - First Protect your box
  - Understand the vulnerabilities they introduced
  - Patch those vulnerabilities
  - Attack those vulnerabilities on the other team's boxes

CTF Styles

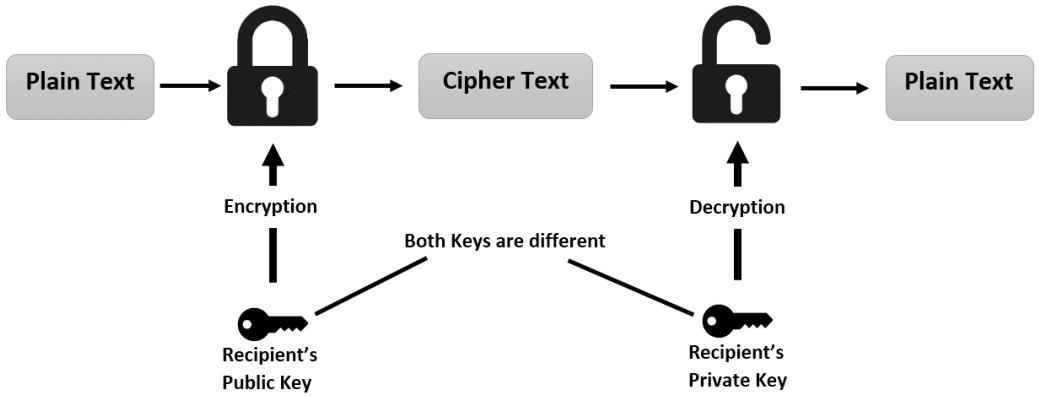
- King of the Hill
  - There will only be one winner
  - Fast paced style of play
  - Identify vulnerabilities
  - Attack the target then patch
  - Hold the target as long as possible to score points

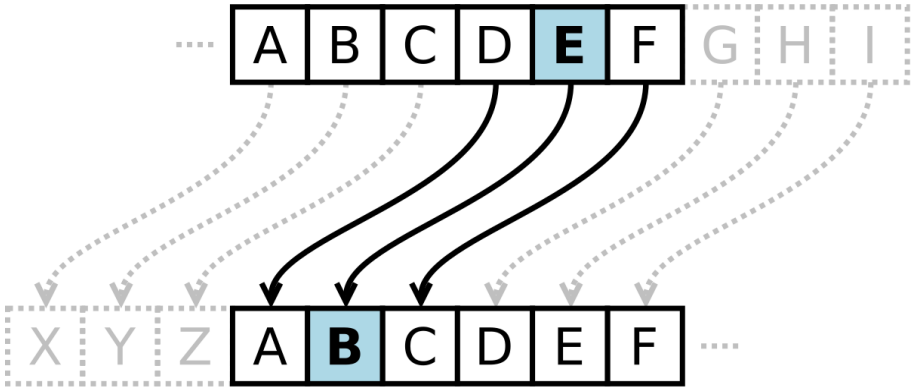
CTF Styles

- Story/Scenario Driven
  - Immersive storyline to follow
  - Variety of challenges woven into the story
  - Not a random collection of challenges
- These are the most entertaining for me

Types of Challenges

- Cryptography
  - Weakness in encryption
  - Weakness in the implementation of encryption
  - Encoding of information
  - Ceasar Ciphers
- Perfect category for developers and math majors





Types of Challenges

- Computer Exploitation
  - Recent Vulnerabilities
  - Misconfigurations
  - Zero Days
  - Credentials
- Perfect category for attackers and defenders
- Way to stay up to date

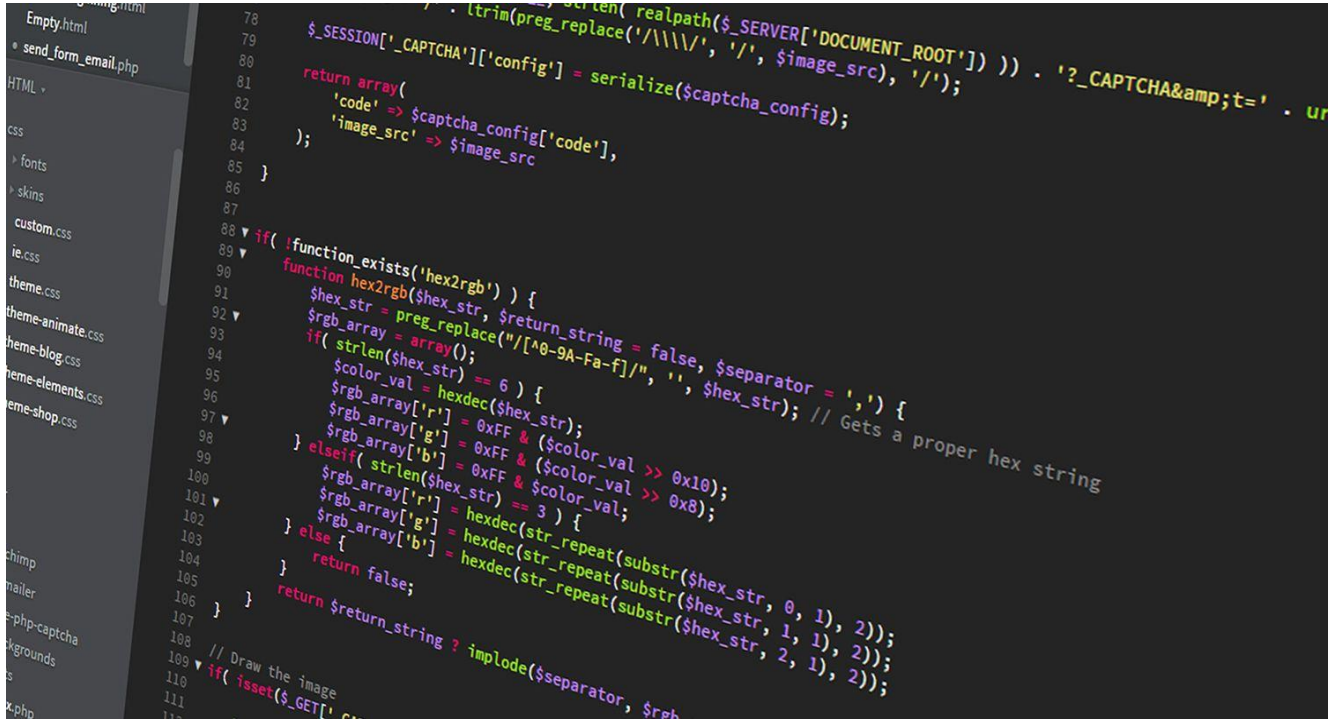
New RCE Vulnerability - CVE-2024-6409

Types of Challenges

- Forensics
  - Disk Image from compromised HDD
  - Metadata of a file
  - Logs from a domain controller
  - PCAPs of network traffic
- Perfect category for anyone who wants to understand how systems truly work

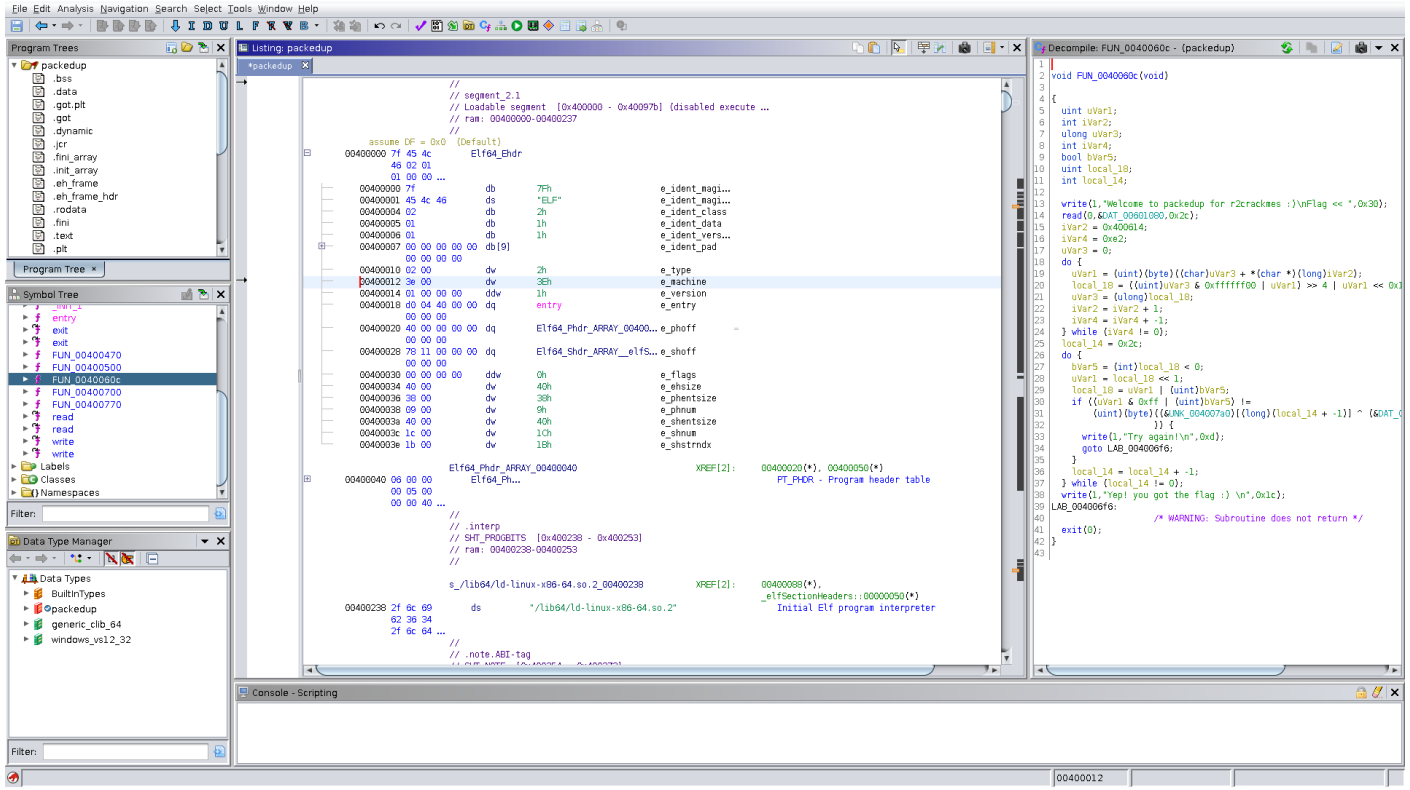
Types of Challenges

- Programming
  - Scaling manual actions
  - Time requirements
  - Advanced attacks
- Perfect category for developers or enthusiasts



Types of Challenges

- Reverse Engineering
  - Decompile binary
  - Patch binary
  - Create exploit
  - Sometimes it is just strings
- Perfect category for low level programmers



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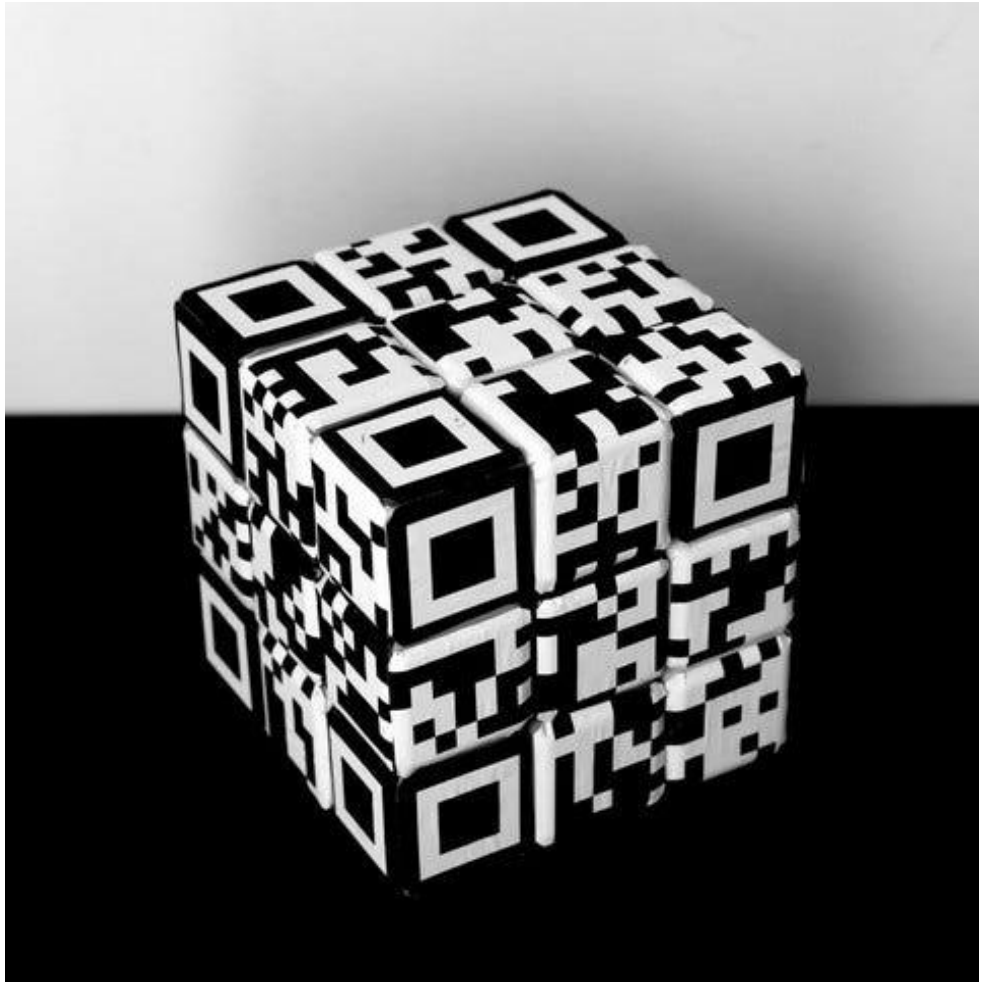
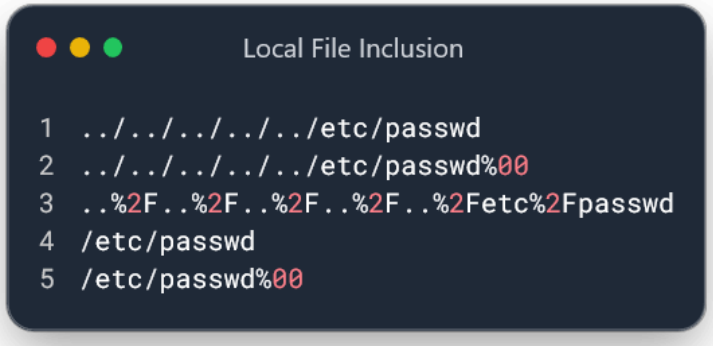
Types of Challenges

- Trivia/Puzzle
  - Author's choice
  - Very fun or frustrating
  - How many lines of code in Win XP?
- Perfect category for anyone



Types of Challenges

- Web
  - Broken Access Control
  - Misconfiguration
  - CSRF, SSRF, XSS, LFI, RFI
- Perfect category for frontend or backend developers



Types of Challenges

- Misc
  - All others fall into this category
  - Unique challenges
- For me this can be a really fun or frustrating category

Technical Skills, Tools and Techniques

WINDOWS

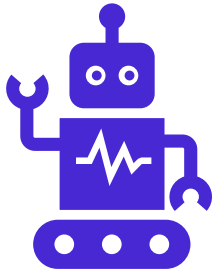
LINUX

INFRASTRUCTURE

NETWORKING

SCRIPTING

Technical Vignettes



IOT CTF

Developed tools

Cross compiled binaries

Learned a lot about IOT

Used those skills on assessments

Malware Reverse Engineering

Rudimentary skills gained through various CTFs

Used on assessments to examine unknown binaries

Non-Technical Skills

CREATIVITY

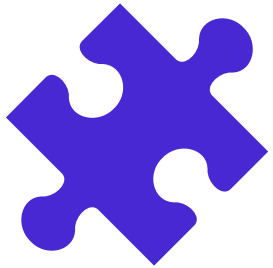
PERSISTENCE

NOTE TAKING

PREPARATION AND PRACTICE

ATTENTION TO DETAIL

Non-Technical Vignette



Geocaching/Escape rooms

Common techniques

Recognizing patterns

Scratch near a puzzle

Timestamp of binaries

Note taking is critical!

Terminal screens

Web requests

Network traffic

Proxy logs

Socializing & Teamwork

- Know your team
- Learn as a team
- Leverage the expertise of others
- Bonding
- Communicating effectively
- Knowledge sharing

Post CTF

- Blog Writeups of the challenges
- Create Video walk throughs
- Build out Tooling
- Test approaches you couldn't during the event
- Analysis and self-improvement

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Running your event

R3DC0N at Intuit

- Internal security conference held twice a year
- Engaging CTF built by the security team
- Participants from across the company
- Experiential learning at it's best

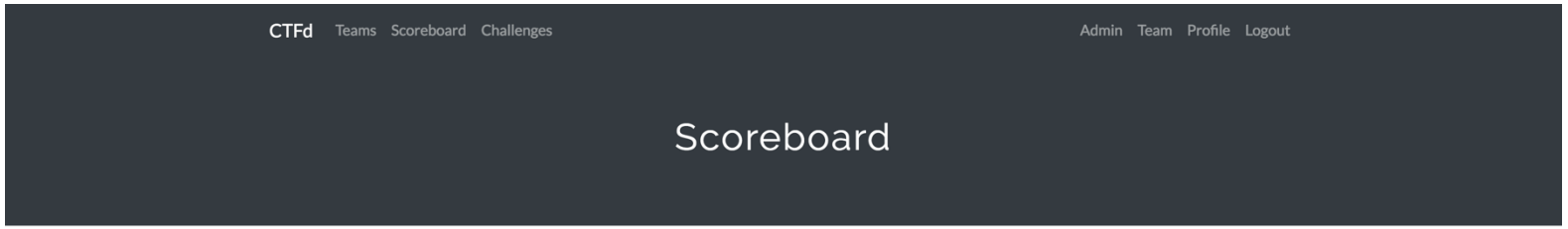
R3DC0N at Intuit

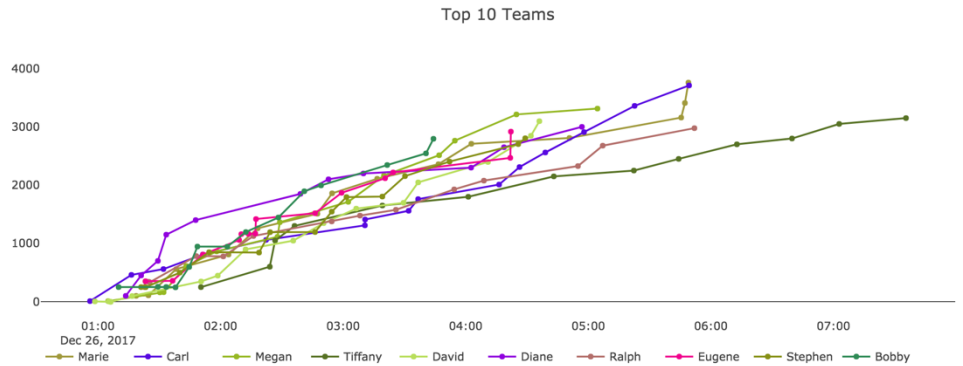
- CTF drives participation in the event
- Provides hands on activities for participants
- Teams from different departments compete
- Prizes for top teams

R3DC0N at Intuit

- 300+ players each time
- Team based
- SWEs, Marketing, PMs, SE, etc
- Beginner to advanced
- Some teams naturally form
- Pair players based on skills

CTFd





Place	Team	Score
1	Marie	3759
2	Carl	3710
3	Megan	3313
4	Tiffany	3150
5	David	3097
6	Diane	3000

Infrastructure

- Challenges usually Docker
- Kubernetes
  - Local
  - Cloud
- Some are machines/networks
  - Terraform
  - Ansible

kubernetes

Infrastructure

- Player devices?
  - Corporate laptop
  - VMs
- Protected Network Access

Value to the company

Builders

Learning and growth in creating challenges

Operating system protections

Deployment of challenges

Container orchestration

Players

Hands-on skills development

Rapid exposure to multiple disciplines

Understanding vulnerabilities

Team Collaboration

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Building an Internal CTF Team

Assembling Your Team

- Diverse skillset is needed, look to complement skillsets
  - Web
  - Reverse Engineer
  - Crypto
  - Programmer
- Practice as a team is crucial
  - Play through completed events with writeups
  - Build the cohesiveness of the team through practice and events
  - Train together to learn limitations

Finding Events

- In person
  - Travel to larger events, but can be costly
  - Local events like BSides and meetups
- Virtually
  - Use CTFTime.org to find events

Marketing

- Build a security brand through reputation
  - Paranoids
  - Project Zero
- Sponsoring Conferences
  - If you are already traveling to an event you could also sponsor one
  - A booth at conference can be used for multiple marketing, recruitment, players

Recruitment

- Identify talent
  - Rapidly assess skills challenging environments
  - Team fit in stressful environments
  - Hidden talent – not everyone who is interested is a security engineer

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Conclusion

“Apply” Slide

- Next week you should:
  - Search for open CTFs that interest you!
  - Find others within your company that are interested and recruit them.
- In the first three months following this presentation you should:
  - Solidify your CTF team
  - Sharpen your skills by trying different types of CTFs
  - Refine your process as you challenge yourself
  - Start to build a CTF internally for practice

“Apply” Slide

- Within six months you should:
  - Feel comfortable applying your skills from CTFs to your technical work
  - Identify events for your team to participate in
  - Host an internal event with the CTF challenges you built
  - Build a plan for the company to sponsor the team and market
- Within a year you should:
  - Your CTF team have participated in a public event
  - Networked with other CTF players

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